

UNITED STATES PATENT APPLICATION FOR

AI
SYSTEM AND METHOD OF LINKING
WIRELESS SIGNALLING PROTOCOL WITH
MEDIA GATEWAY CONTROL PROTOCOL
IN PACKET BASED NETWORK

INVENTORS:

Ki-Hyun Joo

Chol Su Kang

Sung Goo Shim

Jay Wu Hong

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BACKGROUND ART

In accordance with the IS-95, the coded communication signals used in CDMA systems comprise CDMA signals that are transmitted in a common 1.25MHz bandwidth to base stations of the system from mobile or wireless

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David F. Mustard

To alleviate the problems of the system shown in Figure 1 and with the advent of enterprise based wireless networks, some prior art CDMA systems implement the system shown in Figure 2. In the system illustrated in Figure 2, a wireless base station is connected to existing ethernet network infrastructure to enable the CDMA system utilize existing internet protocol techniques to allow communication between wireless devices connected to the ethernet network.

Despite the robustness of the system in Figure 2 in an in-building wireless environment, there are some disadvantages which characterized such system. First, the system in Figure 2 uses a combination of wireless signaling protocol and media gateway control protocol (MGCP). A wireless signaling protocol is necessary in order to handle mobile terminals and current MGCP protocol assumes that the mobile terminal is wired (at least fixed for the duration of a

call). Hence, mobile terminal signaling can not be sufficiently processed using MGCP protocol alone.

Second, the system requires two different protocols to handle wireless voice communication and other media communication. Whereas a signaling gateway can handle wireless communication, a media gateway cannot handle such typical wireless functions such as location registration of a mobile terminal, paging a mobile terminal, processing handoff of mobile terminals from one base station to another during a conversation in the MGCP protocol.

Thus, the system in Figure 2 requires the base station to have two functional protocol units to handle wireless signaling and multi-media transactions. Traditionally in the wireless network, an open interface specification is defined between base stations and mobile switching centers (MSC). The MSC is a Call Agent like entity to handle the mobile terminal signaling. In CDMA wireless network, EIA/TIA -634 specification defines the interface.

On the other hand, EIA/TIA -634 specification does not define the media control of the IP LAN. Because the EIA/TIA -634 specification assumes the circuit based network, the media identifier is specified in terms of TDM circuit ID of a trunk line between a base station and the MSC. Thus, the wireless signaling protocol is also not sufficient to control the packet based media stream on an IP LAN.

In order to handle both wireless mobile terminal signaling and also media traffic of the wireless mobile terminal, it is necessary for the system in Figure 2 to

support both wireless signaling protocol as well as IP media control protocol. For example, in a CDMA network, EIA/TIA –634 and MGCP can be used for such purpose.

In the example illustrated in Figure 2, the protocol interfaces between a Call Agent and a base station are based on a packet based IP LAN. In the example illustrated in Figure 2, a problem typically arises when the wireless signaling protocol and the media gateway controlling protocol are used together between a Call Agent and a base station. A linkage (or mapping) between a call identifier in the wireless signaling protocol and a call identifier of the corresponding call for the same mobile terminal must be made dynamically during each call setup. Because mobile terminals tend to move around within a particular call coverage area, a system mapping of call identifiers statically for a given terminal by a base station is not economically feasible.

Furthermore, EIA/TIA – 634 protocol does not have a method to specify the traffic path on IP LAN associated with a particular signaling call that it is handling. In a conventional circuit based network, EIA/TIA –634 uses 16 bit identification typically known as Circuit Identity Code (CIC) which defines PCM multiplexer id to handle traffic path for a signaling call associated with it. However, this is not adequate for the traffic path on IP LAN because PCM multiplexer is not present on IP LANs and MGCP does not have any method to associate the mobile terminal to the connection. Since MGCP typically deals with the fixed connection, MGCP does not describe mobile endpoints to set up the traffic connections to a call.

Thus, it is desirable to have a system and a method for transmitting CDMA calls including voice and data over a communication pathway with a higher bandwidth. It is further desirable to have a CDMA system that handles the transmission of calls, especially data calls, without the inherent difficulties of using a variety of transmission protocols for the same call. A need further exists for improved and less costly system which improves efficiency and the transmission rate and time of calls between a mobile unit and a base station and between base stations and a base station controller and between adjacent base stations.

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Embodiments of the invention include a system for linking or mapping a call in EIA/TIA -634 specification with a corresponding media gateway control protocol (MGCP) connection. The present invention provides a virtual circuit identity code (VCIC) as a linkage between EIA/TIA - 634 wireless signaling and media gateways control for a mobile terminal in a call agent to base station interface in a packet based network. VCIC includes a base station identifier and a virtual traffic path identifier (VTP id) to uniquely identify the traffic path with the enterprise network under a call agent.

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The WIBS also integrates the base station control functions of the prior art to reduce call setups between a communication unit and the WIBS, and call handoffs between multiple WIBS. The WIBS further provides two functional logical implementation of a signaling gateway and a media gateway for communicating to a call agent utilizing the EIA/TIA -634 protocol and MGCP protocol respectively.

The WIBS also includes an ethernet protocol interface module to enable it communicate over the ethernet back-bone and communicates over the back-bone and the internet using known ethernet and IP protocols. Since the ethernet back-bone uses a communication protocol different from the communication units, data received by the base station is packetized during processing into a format compatible with the ethernet transmission protocol of the ethernet back-bone and also to the internet.

The invention further includes a gateway which includes formatting logic to reformat data generated by the base station over the ethernet back-bone into a format compatible with the public switch network. A router is also connected to the ethernet back-bone to allow the WIBS send and receive data over the internet or an intranet.

The present invention further includes media processing logic which allows multiple WIBS in the system to communicate with each other during a soft handoff of communications between a mobile unit and a WIBS. By enabling adjacent WIBS to communicate during a soft handoff, the present invention reduces the time it takes to implement soft handoffs in a CDMA system and further reduces potential data loss due to such handoffs.

The present invention further provides an implementation advantage over the prior art by allowing inter network communication between the wireless office communication system of the present invention and other mobile networks on the public land mobile network. The inter-networking communication of the present invention is implemented over an IP LAN using the ethernet transport protocol of UDP/IP or TCP/IP transport protocol via an ethernet interface to the ethernet back-bone of the system. The use of the ethernet interface is less costly than the prior art and further allows easy and flexible connectivity to existing in-office, building or campus networks.

These and other objects and advantages of the present invention will no doubt become obvious to those of ordinary skill in the art after having read the following detailed description of the preferred embodiments which are illustrated in the various drawing figures.

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Prior Art Figure 1 is a block diagram of a conventional code division multiplex access (CDMA) system;

Figure 3 is a block diagram of a CDMA network protocol interface on an internet protocol LAN;

Figure 4 is a block diagram of an embodiment of a wireless CDMA communication system of the present invention; and

Figure 5 is a block diagram of an embodiment of the call message flow of the present invention.

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While the invention will be described in conjunction with the preferred embodiments, it will be understood that they are not intended to limit the invention to these embodiments.

On the contrary, the invention is intended to cover alternatives, modifications and equivalents, which may be included within the spirit and scope of the invention as defined by the appended claims. Furthermore, in the following detailed description of the present invention, numerous specific details are set forth in order to provide a thorough understanding of the present invention. However, it will be obvious to one of ordinary skill in the art that the present invention may be practiced without these specific details. In other instances, well known methods, procedures, components, and circuits have not been described in detail as not to unnecessarily obscure aspects of the present invention.

The invention is directed to a system, an architecture, subsystem and method to manage a wireless CDMA data communication in a way superior to the prior art. In accordance with an aspect of the invention, a base station allows CDMA call coverage within a building without requiring a dedicated and a lengthy end-to-end transmission.

In the following detailed description of the present invention, a system and method for a wireless internet protocol based communication system is described. Numerous specific details are not set forth in order to provide a

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WIBS 310 is coupled to the ethernet back bone preferably through a 10/100 base-T interface and related software stack to handle data burst on the LAN that traditional CDMA system could not handle. WIBS 310 receives and sends data to and from cellular regions to other subscription units in the WOS. WIBS 310 further receives radio signals from mobile units and packetizes the contents of the signals into data packets that are delivered over the ethernet back-bone to various destinations such as the PSTN and the internet.

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Referring still to Figure 3, gateway 340 is coupled to the ethernet backbone 311 to receive converted voice signals with WOS 300 from WIBS 310 for delivery to the PSTN. In the present invention gateway 340 preferably is a PSTN or Trunk gateway manufactured by Cisco® systems.

The WIBS 310 comprises a signaling gateway logic 315 and a media gateway logic 320. Signaling gateway logic 315 is coupled to the Call Agent 340 via EIA/TIA -634 signal path to provide communications between the mobile terminals and the Call Agent. Signal gateway logic 315 couples the WIBS 310 to the mobile terminals within the system via radio signaling channels. WIBS 310 further includes logic for creating a virtual traffic path for linking call signals identifiers from signaling gateway logic 315 to a corresponding identifiers in media gateway logic 320.

Media gateway logic 320 also couples the WIBS 310 to mobile terminals via radio traffic channels and to PSTN gateway 350 via a Real-time transport protocol (RTP) signal path to provide a communication path between the WIBS 310 and the public network. Media gateway logic 320 further couples to the Call Agent 340 via MGCP path 302 to provide communication between WIBS 310 and the Call Agent utilizing the media gateway controller protocol (MGCP).

MGCP 320 is designed to interface a media gateway controller and media gateway. The protocol supports a centralized call model. The media gateway controller is Call Agent in MGCP terminology and the media gateway can be either different types of VoIP gateways (residential, trunking, corporate, etc.), network access servers or even voice over ATM gateways. MGCP is a master/slave protocol. It uses other protocols to fulfill its requirements, such as the session description protocol which is used to describe the media aspects of a phone call. Media gateway logic 320 provides WIBS 310 with voice-over IP (VoIP) functionality to enable WIBS 310 to support VoIP services over LAN 301.

In the embodiment shown in Figure 4, during the signal processing of mobile terminal's originated call or a land originated call, the SG 315 receives a request from Call Agent 340 to allocate the mobile to a dedicated traffic channel. The request includes the identification (id) of the VCIC that represents the id of the virtual traffic path of the call. SG 315 processes the request by requesting the MG 320 to allocate a traffic channel and passes the id of VCIC received from Call Agent 340. MG 320 then sends commands to the mobile unit to start using the virtual traffic channel.

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During this process, the traffic path between the base station 505 and the mobile station 501 is established subsequent to establishing of the mobile station and base station communication path, the signaling gateway 503 then responds to the call agent 510 that the mobile station 501 is on a dedicated traffic channel via traffic channel signal 525 (e.g., message y).

Upon establishing the RTP path, PSTN user call answer 550 will start ringing at the PSTN end of the system. PSTN user call answer unit 550 then

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The foregoing descriptions of specific embodiments of the present invention have been presented for purposes of illustration and description. They are not intended to be exhaustive or to limit the invention to the precise forms disclosed, and obviously many modifications and variations are possible in light of the above teaching. The embodiments were chosen and described in order to best explain the principles of the invention and its practical application, to thereby enable others skilled in the art to best utilize the invention and various embodiments with various modifications are suited to the particular use contemplated. It is intended that the scope of the invention be defined by the Claims appended hereto and their equivalents.